

REMARKS

Claims 105-108 and 110-149 are pending. Claims 114-115, 120, 124, 126, 131, 133, 135-136, 138, 140-144 and 147 have been amended.

As a preliminary matter, it has been noted through Patent Application Information Retrieval that papers filed November 2, 2004 and December 16, 2004 should be removed. It appears that the U.S.P.T.O erroneously associated the paper dated November 2, 2004 with the present application. Appropriate correction is requested.

Claims 136, 138 and 140 were rejected under 35 USC §112, first paragraph. Favorable reconsideration of this rejection is requested in view of the amendments made herein.

Claims 136 and 138 have been amended to recite “wherein the secondary charged particle detectors in the first row and the secondary charged particle detectors in the second row are disposed oppositely each other in order not to interfere with each other,” as based on Fig. 43 and its associated description. Claim 140 is similarly amended with respect to “secondary electron detectors.” It is believed that the amended claims 136, 138 and 140 are in full compliance with 35 USC §112.

Claim 115 was rejected under 35 USC §112, second paragraph, as being indefinite. Claim 115 has been amended to recite “at a distance greater than the interval of neighboring charged particle beams simultaneously.” Favorable reconsideration of this rejection is earnestly solicited.

Claims 114, 135 and 141 were rejected under 35 USC §102(b) as being anticipated by Nakasuji. Favorable reconsideration of this rejection is earnestly solicited.

Claim 114 has been amended to specify one primary optical system and one secondary optical system. It is respectfully submitted that Nakasuji fails to teach the combination of features set forth in amended claim 114. Claim 135 also has been amended to recite a specific combination of elements not taught by Nakasuji. In addition, claim 141 has been amended to distinguish over Nakasuji.

It is respectfully submitted that Nakasuji fails to teach or suggest the features of the amended claims.

Claims 105, 113, 116-119, 124, 125, 127-132, 134 and 143-147 were rejected under 35 USC §103(a) as being unpatentable over Nakasuji in view of Brunner et al. Favorable reconsideration of this rejection is requested in view of the amendments made herein.

Claim 105 recites a feature "wherein there is at least one lens between the E x B separator and the detectors". This feature is not obvious from Nakasuji or Brunner et al., since Nakasuji does not use an E x B separator and Brunner et al. does not use a lens between the E x B separator (WF in Fig. 2) and the detector DT.

Claim 113 recites all features of claim 115 and, therefore, is not obvious from Nakasuji or Brunner et al., for the same reason as claim 105 discussed above.

Each of claims 116 and 117 includes all features of claim 114 which is patentable over Nakasuji by the reason described in above item 4. The combination of features defined in amended claims 114, 116 and 117 are neither disclosed nor suggested by Brunner et al. and are believed to be patentable over Nakasuji and Brunner et al.

Claim 118 includes the feature "an E x B separator disposed between the objective lens and a lens at the side of a beam source." Nakasuji does not use an E x B separator. Brunner et al. uses an E x B separator disposed between a beam source and a second lens, however there is no E x B separator "disposed between the objective lens and a lens at the side of a beam source". In more detail, comparing the apparatus defined in claim 118 and that of Brunner et al., a beam path through which both the primary and secondary charged particle beams pass in Brunner et al. is longer than that of claim 118 by a distance of one lens and the beam path of Brunner et al. receives an extra space-charge effect, thus its primary charged beam becomes obscure and, therefore, a large primary beam can not flow. In the apparatus defined in claim 118, since the secondary charged particle beam is separated by the E x B separator after passing the objective lens before entering the lens at the side of the beam source, it is possible to decrease the influence of the space-charge effect by the secondary charged beam to the primary charged beam.

Claim 119 recites all features of claim 118, and is patentable over over Nakasuji and Brunner et al. for the same reasons described above item 5-3.

Claim 124 includes the feature "wherein the second charged particles are separated from the primary charged particle beams after they pass through the objective lens before they enter to the next lens". In Nakasuji, the second charged particles do not pass through the objective lens. In Brunner et al., the second charged particles pass two objective lens which necessitate difficult adjustment to satisfy the focusing conditions of both the primary and secondary charged particle beams.

Claim 125 recites the feature "a secondary optical system having at least one stage lens between the E x B separator and the detectors". This feature is not described or obvious from Nakasuji or Brunner et al. In Brunner et al, the focusing condition of the secondary optical system is not adjustable if the focusing condition of the primary optical system is adjusted by the two stage lenses, and the primary beam may have a large size at the position of the detector (larger than the size of the detector) which makes the detecting efficiency worse.

Claim 127 recites the feature "the position of the single aperture plate in the direction of the optical axis thereof is disposed so as to minimize the difference in beam strength of the beams to be delivered from each aperture to the surface of the sample". This feature is not described or obvious from Nakasuji or Brunner et al. Claim 127 is industrially significant since it is an effective technology to increase strength of a beam apart from the optical axis as compared to that of a beam disposed in the central portion.

Claim 128 recites the feature "wherein an amount of deviation is set so that a difference between an amount of detection of the secondary charged particles obtained for the plurality of the apertures is minimized when a sample with no pattern is disposed on a surface of the sample". This feature is not described or obvious from Nakasuji and Brunner et al.

Claim 129 recites all features of claim 125 and, therefore, is patentable over Nakasuji and Brunner et al. for the same reasons as claim 125 described above.

Claim 130 recites the feature "wherein the positions of the plurality of the apertures are disposed so as to correct a distortion of the primary optical system." This feature is not described or obvious from Nakasuji or Brunner et al. The number of beams may advantageously be increased by 50-100% by using the technique of claim 130.

Amended claim 131 recites the feature "wherein one secondary optical system has at least one lens along said optical axis and multiple detectors". This feature is not described or obvious from Nakasuji or Brunner et al.

Claims 132 and 134 recite respectively all features of claim 131 and, therefore, are patentable over Nakasuji and Brunner et al. for the same reasons as claim 131 described above.

Claim 143 recites the combination of features "irradiating a beam emitted from a single beam source with multiple emitting cathodes to an aperture plate with a plurality of apertures" and "delivering the separated secondary charged particles through a secondary optical system into a plurality of detectors so as to be detected". This combination is not described or obvious from Nakasuji or Brunner et al.

Claim 144 recites the combination of features "irradiating a beam emitted from a beam source with multiple integrated cathodes to an aperture plate with a plurality of apertures" and "delivering the separated secondary charged particles through a secondary optical system into a plurality of detectors so as to be detected". This combination is not described or obvious from Nakasuji or Brunner et al.

Claim 145 recites the feature "wherein the plurality of apertures are located within a range of a predetermined current density of the charged particles emitted from the beam source". Claim 145 enables to create multiple beams having the same strength which is very important for inspection of the sample. This feature is not described or obvious from Nakasuji or Brunner et al.

Claim 146 recites the feature "an E x B separator disposed between the objective lens and a lens at the side of the beam source". This feature is not described or obvious from Nakasuji or Brunner et al.

Claim 147 recites the feature "wherein the secondary charged particles emitted from the surface of the sample at an angle at least 45 degrees relative to a normal line of the surface of the sample pass through the secondary optical system, and wherein an accelerated field for the secondary electron is formed between the objective lens and the surface of the sample". This enables to converge the secondary charged particles emitted from the surface of the sample at an angle at least 45 degrees into a small spot on a surface of the detecting elements since an accelerated field for the secondary electron is formed between the objective lens and the surface of the sample. This feature is not described or obvious from Nakasuji or Brunner et al.

Claims 106-108 and 111 were rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji in view of U.S. Patent No. 4,954,705 to Brunner et al., and further in view of U.S. Patent No. 6,344,750 to Lo et al. (page 8 of the Action). Each of these claims depends directly or indirectly on claim 105. Lo et al., like Nakasuji and Brunner et al. does not disclose the feature "wherein there is at least one lens between the E x B separator and the detectors" of claim 105. Accordingly, claims 106-108, and 111 are not obvious from Nakasuji, Brunner et al. and Lo et al.

Claims 110 and 112 were rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji, Brunner et al., and Lo et al. and further in view of U.S. Patent No. 4,911,103 to Davis et al. (page 9 of the Action). Each of these claims depends directly or indirectly on claim. Davis et al., like as Nakasuji, Brunner et al. and Lo et al., does not disclose the feature "wherein there is

at least one lens between the E x B separator and the detectors" of claim 105. Accordingly, claims 110 and 112 are not obvious from Nakasuji, Brunner et al., Lo et al. and Davis et al.

Claims 114, 120-123 and 142 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,430,292 to Honjo et al. (page 10 of the Action). In order to overcome this rejection, the claims have been amended.

Claim 114 recites the features "one primary optical system with an optical axis for irradiating the sample with a plurality of charged particle beams", "one secondary optical system with an optical axis for leading the secondary charged particles to a plurality of detectors" and "wherein the plurality of the charged particle beams are irradiated each at a position separated by distance resolution of the secondary optical system". In Honjo et al., one primary optical system has an optical axis for irradiating the sample with a single charged particle beam, and one secondary optical system has a single detector. It is only when one primary optical system has an optical axis for irradiating the sample and a plurality of charged particle beams like claim 114 that the distance between charged particle beams becomes a problem, and it differs from Honjo et al.

Claim 120 recites the revised feature "the primary charged particles are disposed inside a circle of which center is said optical axis". This feature is not disclosed by Honjo et al. and, therefore, is not anticipated by Honjo et al.

Claim 121 recite the feature "the plurality of apertures are located within a range of a predetermined current density of the charged particles emitted from the beam source". This feature is not disclosed by Honjo et al. and, therefore, is not anticipated by Honjo et al.

Claims 122 and 123 recite all features of claim 121 and 120 respectively and, therefore, they are not anticipated by Honjo et al. for the same reasons described above.

Claim 142 recites the features "irradiating the sample with a plurality of primary charged particle beams through at least one primary optical system", "leading the secondary charged particles to at least one detector through at least one secondary optical system", and "wherein the primary plurality of the charged particle beams to the sample are irradiated with each spaced by a distance greater than a distance resolution of the secondary optical system". In Honjo et al., one primary optical system has an optical axis for irradiating the sample with a single charged particle beam, and one secondary optical system has a single detector. It is only when one primary optical system has an optical axis for irradiating the sample and a plurality of charged particle beams like claim 142 that the distance between charged particle beams becomes a problem, and claim 142 differs from Honjo et al.

Claim 126 was rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji and Brunner et al., and further in view of Honjo et al. (page 12 of the Action). Claim 126 has been amended to recite the feature "the detectors in the first row and the detectors in the second row are disposed oppositely each other in order not to interfere with each other". This feature is not described or obvious from Nakasuji, Brunner et al., or Honjo et al.

Claims 137, 139 and 148 were rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji and Brunner et al., and further in view of U.S. Patent No. 6,614,026 to Adamec. (page 12 of the Action).

Claim 137 recites the feature "wherein an image of each of the plurality of the apertures is formed by irradiating the aperture plate with the beam from the beam source, and a scanning

voltage is superimposed on an electric field of the E x B separator so as to have the beam deflect". This feature is not described or obvious from Nakasuji, Brunner et al., or Adamic. For scanning purposes only, there is no substantial difference between superimposing scanning voltage (signal) to the electric fields of the E x B separator and to the magnetic fields of the E x B separator. However, in case of claim 137, since the apparatus uses a plurality of beams, a substantial difference arises between superimposing a scanning signal to the electric fields of the E x B separator and to the magnetic fields of the E x B separator. That is, if the scanning signal is superimposed to the magnetic fields of the E x B separator, the secondary charged particles (electrons) are deflected in the direction opposite to that of the primary charged particles (electrons), and the secondary charged particles are not directed to the detector after exiting from the E x B separator when scanning is made at a position apart from the optical axis. To the contrary, if the scanning signal is superimposed to the electric fields of the E x B separator, the secondary charged particles (electrons) are deflected in the same direction as that of the primary charged particles (electrons) by the scanning voltage, the secondary charged particles tend to return toward the optical axis and are conveniently directed to the detectors even if scanning of the primary beams is made at a position apart from the optical axis.

Claim 139 recites all features of claim 137 and, therefore, is patentable over Nakasuji, Brunner et al. and Adamic for the same reasons as claim 139 described above.

Claim 148 recites the feature "wherein the beam from the beam source is irradiated onto the aperture plate to form an image of the plurality of apertures, and a scanning voltage is superimposed on an electric field of the E x B separator so as to cause a deflecting operation of

the beam". This feature is not described or obvious from Nakasuji, Brunner et al., or Adamic, for almost the same reasons described above.

Claims 133 and 149 were rejected under 35 U.S.C. 103(a) as being unpatentable over Nakasuji and Brunner et al., and further in view of U.S. Patent No. 6,509,569 to Frosien (page 13 of the Action).

Claim 133 has been amended to overcome the rejection by reciting the feature "wherein the primary optical system has a deflection system which scans the charged particle beams simultaneously". This feature is not described or obvious from Nakasuji, Brunner et al., and Frosien.

Claim 149 recites the feature "wherein the beam from the beam source is irradiated onto the aperture plate to form an image of the plurality of apertures, a position of the image of the plurality of apertures is made to correspond to a position of the E x B separator". This feature is not described or obvious from Nakasuji, Brunner et al., and Frosien.

For at least the foregoing reasons, the claimed invention distinguishes over the cited art and defines patentable subject matter. Favorable reconsideration is earnestly solicited.

Should the Examiner deem that any further action by applicants would be desirable to place the application in condition for allowance, the Examiner is encouraged to telephone applicants' undersigned attorney.

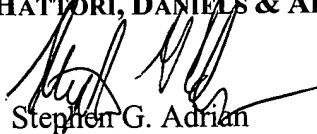
If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

Amendment
Serial No. 09/891,611
Attorney Docket No. 010817

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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Attachment: Petition for Extension of Time